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REVIEWS.

Elemente der Gesteinslehre. By H. ROSENBUSCH, Stuttgart, 1898.

That this book presents the essential features of Professor Rosenbusch's lectures on petrology as they have been developed during thirty years of his experience, is sufficient guarantee that the work is a most valuable contribution to the didactic side of the subject. That those who are not permitted to listen to Professor Rosenbusch in Heidelberg may read his careful presentation of the essential characteristics of rocks is fortunate, and the appearance of the book so long looked for is a fact upon which many may congratulate themselves. No satisfactory review of a work so full of matter can be given without close and exhaustive reading, but some insight into its character may be gotten without exhausting the subject.

In attempting to condense the wide range of facts and speculations relating to igneous, sedimentary and metamorphosed rocks into the space of an elementary text-book, minor details and qualifications of statements are minimized or omitted, thereby sharpening the outlines of the images presented to the mind. As a necessary result we find in some cases positive statements where we should expect tentative ones, and a tone of finality in portions of the work where we had not expected it. This is of course noticeable in the introductory portions of the parts devoted to the three categories of rocks.

The general introductory chapter, after defining a rock, and the scope of petrology, treats of the methods of investigating rocks, geologically, mineralogically and chemically, special attention being given to the chemical characteristics. Definitions of the principal terms used in connection with the mineral constituents are followed by an account of varieties of parting and jointing of rocks and a brief statement of their formation and classification.

Part I deals with eruptive rocks, first considering their constituents as chemical compounds and as minerals, and the relation of the latter to one another both as to the order of their crystallization and as to their morphology. Then their geological characteristics are described.

Considerable space is given to their texture or structure, with special reference to their interpretation in terms of the occurrence of the rocks and the order of crystallization of the mineral constituents. The age of igneous rocks and their alteration and metamorphism are briefly treated, and a system of classification is given without discussion of the principles on which it is based. The classification followed is the same as that employed in Professor Rosenbusch's work on the Microscopical Physiography of the Massive Rocks, with slight modification in the divisions embracing "*Tiefengesteine*" and "*Ganggesteine*." An age distinction has disappeared from the grouping of "*Ergussgesteine*," so that liparite and quartz-porphyry are described together.

The description of each class of rocks embraces the mineralogical and microscopical characteristics, besides the chemical composition, which is shown in ample tables of analyses both of the rocks as a whole and of separate mineral constituents. This feature is a very marked addition to the treatment of the subject in the Microscopical Physiography of Massive Rocks. The metamorphism of igneous rocks themselves and that produced by them upon adjacent rocks is described in immediate connection with the description of the unaltered rocks.

The part devoted to stratified rocks follows the same general plan as Part I. The rocks are classified under the heads of: precipitates, psephites and psammities, silica rocks (not previously described), carbonate rocks, iron rocks, clay rocks, porphyroids and fossil fuels. In this part also, considerable is introduced that belongs to the subject of metamorphism.

Part III treats of the crystalline schists, their composition, geological occurrence, texture and classification. Crystalline schists are said to be eruptive or sedimentary rocks that have attained geological transformation chiefly through the coöperation of geo-dynamic agencies. The classification of these rocks is that commonly used and the author recognizes its artificial and unsatisfactory character but considers our knowledge and judgment in the matter not yet sufficiently advanced to warrant any attempt at its betterment at this time. The order followed is: gneisses, mica-schists, talc-schists, chlorite-schists, amphibole and pyroxene rocks, serpentine, rocks of the lime series, magnesia series, iron series, and emery (corundum). In each class the mineral and chemical compositions are described together with the texture and the varieties of rock embraced within each class.

Whatever may be our view of the position taken by Professor Rosenbusch upon certain mooted questions in petrology, we must acknowledge the great value of this recent work, and congratulate the author upon its publication.

J. P. I.

A Text Book of Mineralogy with an extended treatise on Crystallography and Physical Mineralogy, by E. S. DANA, New York, John Wiley & Sons, 1898.

This is a new edition of Professor Dana's former text-book entirely rewritten and enlarged. It consists of four parts devoted to crystallography, physical mineralogy, chemical mineralogy, and descriptive mineralogy, and contains an appendix treating of the drawing of crystal figures, and of projections, besides one giving tables to be used in the determination of minerals.

The relation of crystal form to other physical properties and to the probable molecular structure of crystals is set forth in the introductory paragraphs of Part I, and the grouping of the crystal forms is made in relation to the thirty-two classes of symmetry. For this reason it would seem that a more logical arrangement of the subject would place the physical mineralogy first and the crystallography afterwards.

The arrangement of the types of crystal forms although referred to the classes of symmetry is the order usually employed in elementary treatises, namely, the group with the most complex symmetry first. The necessity for this order of arrangement is questionable.

The treatment of the six crystallographic systems is quite full and in addition to the description of the symmetry and principal forms are given their spherical projection and the mathematical relations of each system. Compound or twin crystals and the irregularities of crystals are described at length and are profusely illustrated.

The physical characters of minerals are treated briefly in connection with those of cohesion, elasticity, and relative density, as well as those related to heat, electricity, and magnetism. The optical properties are considered at greater length, both as to the principles involved and their application to the optical investigation of minerals. In this respect the improvement over former editions of the Text Book is marked. The part devoted to chemical mineralogy includes a statement of the general principles of chemistry which apply to minerals